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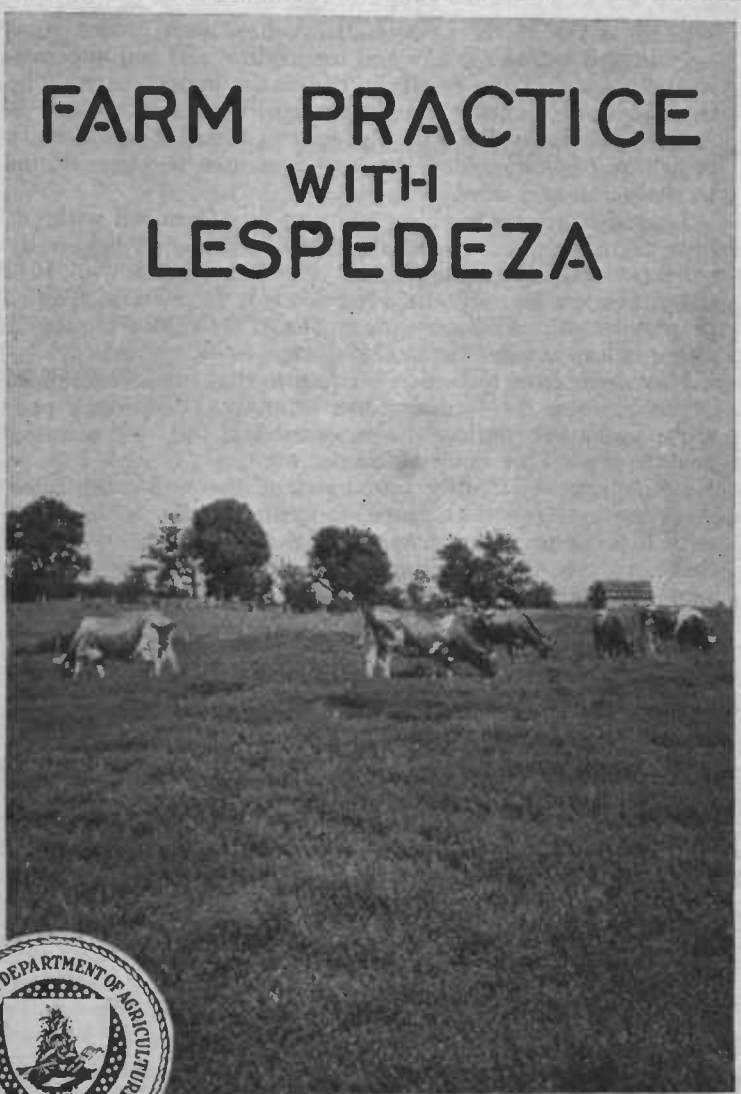
FARM PRACTICE WITH LESPEDEZA



THE COMMON LESPEDEZA has been grown to a limited extent for hay and for pasture and soil improvement in some of the Southern States for many years. The introduction of earlier and larger growing varieties has increased the use of the crop in localities where it was already grown and has extended the lespedeza area to other States to the north and west.

Lespedeza grows readily on almost any farm soil without lime or other special soil treatment. The seed is usually sown on top of the ground much as red clover is sown. It is not necessary to cover the seed when it is sown on freshly prepared land. Fall-sown grain should be lightly harrowed either before or after the seed is sown.

Hay made from lespedeza is equal to that made from most other legumes for feeding farm animals. Lespedeza provides pasturage during the summer and fall, when many pasture grasses are more or less dormant.

Lespedeza fits readily into most of the well-established cropping systems of the area and can usually be included with little or no rearrangement of the other crops. Seeded early in the spring, it will produce a crop of hay or seed the same year, and usually the shattered seed will come up and produce a crop the following year.

On some run-down soils yields of corn, cotton, and small grains have been more than doubled after lespedeza has occupied the land for 1 to 3 years.

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FARM PRACTICE WITH LESPEDEZA

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CONTENTS

	Page
Introduction	1
Lespedeza as a farm crop	1
Varieties	2
Methods of seeding	3
Time and rate of seeding	4
Hay	5
Pasture	6
Soil improvement	8
Fertilizers	11
Lime	12
Soil erosion	12
Orchard cover	12
Cropping systems	13
Seed	16
Weeds	17

INTRODUCTION

THE USE OF LESPEDEZA as a farm crop has rapidly increased during the past few years. The increase in the use of lespedeza is due partly to the excellent results that have been obtained by the farmers who have been growing the Common variety, for hay and for pasture and soil improvement, but more particularly to the introduction of some new varieties that produce better yields, are adapted to a wider range of climatic conditions, and are generally better suited to the needs of the average farm than is the Common variety.

This bulletin is based on information collected from farmers located in the States of Virginia, North Carolina, Tennessee, and Kentucky who are growing lespedeza regularly as a farm crop. The information includes methods of seeding, varieties used, the place in the cropping system usually occupied by lespedeza, and practices that have developed in connection with the production and use of the crop in these States.

LESPEDEZA AS A FARM CROP

Lespedeza came naturally into Virginia, North Carolina, Tennessee, and Kentucky and was growing in pastures and other places not disturbed by the plow long before it was grown as a field crop. In west Tennessee and the western part of Kentucky this plant was utilized to some extent for hay and pasture. The practice of sowing it on small grain did not develop in this section until about 1910. A few years later lespedeza began to be grown in some of the piedmont counties of North Carolina. Seed at that time came mostly from Mississippi and was a strain of the Common variety. Later, seed was produced locally for farm use, and the crop became well established in these two localities. The use of lespedeza as a field crop did not spread much to other parts of these States until after 1925, when seed of the new and larger growing varieties came on the market.

[1] This investigation was conducted in cooperation with the Division of Forage Crops and Diseases, Bureau of Plant Industry. Credit is due R. E. Stitt and Howard Hyland, assistant agronomists, for assistance in obtaining the farm-practice records. Acknowledgement is also made of the information supplied by farmers, the valuable assistance of county agricultural agents in making contacts with growers, and the helpful suggestions of the officials of the experiment stations.

The production of seed for sale, which was stimulated by good prices, overshadowed for a time the use of the new varieties for hay and pasture purposes. This served to give certain of these varieties a much wider distribution than would otherwise have taken place in so short a time. It also resulted in lespedeza being grown on some of the best land as well as on land in need of improvement.

In much of the area made up of the four States of Virginia, North Carolina, Tennessee, and Kentucky red clover has been chiefly relied on for many years to keep the soil in a productive condition; where it can be successfully grown there is no better crop for this purpose. On many farms, however, it has become increasingly difficult to grow clover without lime. Even after the land has been limed, unfavorable seasons and other causes have made clover failures all too frequent. Lespedeza has not only filled the gap left vacant on these farms by the failure of the clovers, but it has provided a means of building up and maintaining the fertility of the soil over a considerable part of the area where red clover cannot be grown.

Lespedeza will grow on almost any type of soil. It does well on the sandy loam soils of the Coastal Plain, the clays of the piedmont, and the limestone soils of Virginia, Tennessee, and Kentucky. Like most other farm crops, lespedeza does better on good land and makes its best growth on fertile, moist bottomland, where yields of 2 to 3 tons of hay per acre are not uncommon.

VARIETIES

The four varieties of lespedeza most generally grown at present are the Common, Tennessee 76, Kobe, and Korean. All of these are annuals; that is, they grow from seed each year. They make their best growth during the summer months; grow more upright in thick stands; and although drought resistant, they make larger yields of hay on fertile moist bottomlands than they do on the drier uplands.

When seed of the improved varieties became available, it was natural that the farmers who were already growing the Common and who were familiar with the details of production should be among the first to grow them. In many cases two or more varieties were grown on the same farm and in some cases in the same field, providing an excellent opportunity for a comparison of varieties. The Kobe and the Korean also began to be grown in other parts of these States where lespedeza had not been grown before.

The Common variety is an excellent pasture plant, coming as it does into native pastures and waste places. It reseeds even when closely grazed and, although more persistent, it does not provide as much grazing as some of the earlier, larger growing, varieties. The plants of the Common variety have a spreading habit, grow close to the ground, and, except in thick stands on fertile, moist land, this variety does not make very large yields of hay. Under similar conditions the Kobe and Tennessee 76 will yield from 30 to 50 percent more hay. This in a large measure accounts for the fact that these two varieties are replacing the Common as a hay and pasture crop on many farms in North Carolina and Tennessee.

The Tennessee 76 is a selection from the Common made by the Tennessee Agricultural Experiment Station. Although this variety retains some of the characteristics of the parent stock, it grows more

upright and produces larger yields of hay than the Common. It is largely because of the more upright growth and larger yields of hay that Tennessee 76 has replaced Common on many farms in North Carolina and Tennessee.

Both of these varieties are late and do not provide much pasturage before July but continue to grow until killed by frost in the fall. Common matures seed 2 to 3 weeks earlier than Tennessee 76. The seed yield of the latter is sometimes cut short by early frosts. These two varieties are grown more generally in west Tennessee and the southern half of the piedmont section of North Carolina than in other parts of the area. Common is also grown in that part of Kentucky west of the Tennessee River and occurs as a naturalized plant in other parts of Kentucky and Virginia, where it comes naturally into pastures and waste places.

The Kobe variety usually provides somewhat earlier grazing than Common, matures seed in October, and like Common and Tennessee 76 continues to grow until killed by frost in the fall. Kobe not only does well in the same localities of North Carolina and Tennessee where Common and Tennessee 76 are grown, but is also producing good yields of hay and seed in other parts of these States and in western Kentucky and the eastern part of Virginia. As only a small proportion of the seed matures before the middle of October, Kobe may not produce much seed in the higher altitudes of these States or where killing frosts occur before the latter part of October.

Seeded at the same rate as the other varieties, Kobe usually produces a thinner stand. This was regarded by some growers as a weakness of the variety. Since Kobe seed is somewhat larger than seed of the other varieties, there are fewer seed per pound, so to obtain the same stand more pounds per acre must be sown. For that reason most growers sow from 10 to 15 pounds more per acre of Kobe seed than they do of the other varieties. The experience of many farmers who have grown the four varieties is that Kobe will make more growth on thin land, will produce larger yields of hay, and is less affected by "seald" than the others.

The Korean differs from the other varieties in several important respects. The seed germinates at a lower temperature, and the young plants make more growth early in the season than do those of the other varieties. As a result Korean will provide grazing for livestock from 2 to 3 weeks earlier than Common. As Korean starts earlier in the spring and matures seed 3 to 4 weeks earlier than the other varieties, it is adapted to a much wider range of climatic conditions. It not only does well in North Carolina and Tennessee but is now grown much farther north and readily produces an abundance of seed where killing frosts do not occur before the middle of September. Because of its early maturity Korean is not so well suited as some of the other varieties to the Gulf States, except the extreme northern parts.

METHODS OF SEEDING

Farmers who grow wheat, rye, oats, and barley usually sow lespedeza on top of one of these grains early in the spring. The seed is usually sown broadcast either by hand or with a hand broadcast seeder and is not covered, although most growers agree that the seed should be lightly covered. Lespedeza seed sown on a hard, smooth soil may drift into piles causing an uneven stand, and in some cases

it may actually be washed away during a hard rain. For this reason many growers prefer to go over the fall-sown grain with a section harrow, set so the teeth slope back just enough to slightly loosen the soil after the seed has been sown. Others sow the seed behind the harrow. Either method gives good results. The action of the harrow does not injure the grain.

Another method used by some growers is to sow the seed with a disk grain drill. The drill is set so the disks cut a shallow groove in the soil. This prevents the seed from drifting and provides sufficient loose soil to cover the seed. Land on which spring oats has been sown provides a good seed bed for lespedeza. In this case the seed is nearly always sown broadcast behind the drill. Farmers that do not grow the small grains sow lespedeza on land that was in soybeans or an intertilled crop the year before. Cotton and corn ground is prepared for lespedeza by disking and harrowing to level the surface, after which the seed is sown broadcast and left on top of the ground to be covered by the first rain. Lespedeza sown on ground prepared in this way, if covered at all, should be covered very lightly.

Lespedeza is frequently sown under conditions that make it rather difficult to obtain the ideal seed bed. This is the case when it is sown on meadows, pastures, and eroded hillsides. In such cases the seed is sown broadcast on top of the ground, and nature does the rest. The results in most instances are surprisingly good. A more dependable method, and one followed by some farmers in seeding lespedeza on old pastures, is to go over the pasture with a spring-tooth harrow set lightly or a disk set at a slight angle in order to loosen some soil before the seed is sown.

TIME AND RATE OF SEEDING

In North Carolina and Tennessee, lespedeza is usually sown during February and March, and in Kentucky and Virginia, during March and the first half of April. The time of seeding, within rather wide limits, is less important than the condition of the land at the time of seeding. It can be sown much later in the spring on freshly prepared land. The seed can be readily covered by mechanical means or left to be covered by the action of rain. When the seed is to be sown on top of winter grain, old pastures, or land lying out, most growers prefer to sow early while the land is still soft and porous, so the seed can work down into the soil before it germinates, rather than wait until the land has become hard and dry. There is some risk in very early seeding, especially in the case of Korean and Kobe varieties.

Seed sown early may germinate during a period of mild weather, and later the young plants may be killed by freezing temperatures. Many February seedings were killed by the severe freeze the first week of March in 1932, making it necessary to reseed the fields. Volunteer stands were also killed, but in most cases seed left in the soil came up later and produced good volunteer crops that year. This was an unusual season.

The rate of seeding depends to a certain extent at least on the purpose for which the crop is to be grown and whether a full stand is to be obtained the first year. If a full stand is expected the first year the usual rate of seeding is from 25 to 30 pounds per acre. Many growers prefer to sow from 35 to 40 pounds per acre. The heavier seeding gives better weed control and usually produces larger yields

of hay. It should be remembered that all of the annual varieties grow taller and more upright in thick stands. If a full stand is not expected the first year, 10 to 15 pounds per acre will make a fair crop the first year and will reseed the land for a full crop the following year.

The rate of seeding when the crop is intended for pasture is usually from 20 to 25 pounds per acre for lespedeza alone and from 15 to 20 pounds per acre when sown on old pastures that are in need of improvement. The quantity of lespedeza seed included in pasture mixtures varies from 6 to 10 pounds per acre.

HAY

Most growers consider hay made from lespedeza equal in value to hay made from most other legumes for feeding farm animals. Lespedeza hay is readily eaten by all classes of livestock, and there is little or no waste in feeding it. It can be cut at almost any stage of maturity, from the time there is sufficient growth to justify cutting

FIGURE 1.—A good stand of lespedeza on fairly productive upland soil.

until after the seed begins to ripen, without greatly affecting the quality of the hay, except where the growth is very large. In thick stands where the plants grow large the leaves near the ground may drop off. This is locally known as "scald." It reduces the proportion of leaves to stem, and since the stems are larger than where the growth of plants is moderately large there is some waste in feeding.

Lespedeza hay is usually more easily cured than is a similar tonnage of other legumes. A light crop can be cut and hauled in the same day. The usual practice with a heavy crop is to cut it after the dew is off and rake it into windrows before the hay is completely dry in order to prevent the leaves from shattering. The hay is then allowed to cure in the windrow or small cock for a day or two, depending on the yield and weather conditions.

The yield of hay depends on several factors, the more important of which are soil fertility and moisture. On thin upland soils not more than 1 ton per acre can be expected. On moist, fertile bottomland yields of 2 to 3 tons per acre are not unusual (fig. 1).

Mainly because of the thicker stand, second-year volunteer crops usually produce larger yields of hay than do first-year seedings. Third-year volunteer crops are more likely to be weedy and therefore not so desirable for hay.

When a volunteer crop is expected, following a crop of hay, the hay must be cut early and high enough so the second growth will have time to produce seed, or the cutting must be delayed until part of the seed has matured sufficiently to be shattered out while the hay is being cut.

By taking advantage of the fact that some grasses are ready to cut for hay in May and June, a crop of grass hay and a crop of lespedeza hay can be obtained the same year. An example follows: A mixture of red top and orchard grass was sown with winter oats in the fall. The following spring 30 pounds per acre of Kobe lespedeza was sown on top of the oats and grass in March. The oat crop was harvested for grain and the Kobe lespedeza for seed. The next year 2 tons per acre of grass hay was harvested in June and 1½ tons per acre of lespedeza hay in October. The following year the grass made a yield of 1½ tons and the lespedeza of 2 tons of hay per acre.

PASTURE

Lespedeza sown on small grain early in the spring is usually ready for grazing soon after the grain is removed from the field. Sown alone, the Korean variety will usually be ready early in June, Kobe about 2 weeks later, and Common and Tennessee 76 about the first of July. The pasture season for Korean extends into September, when the seed matures and the plants turn brown. The other varieties are later and usually stay green until frost. The lespedezas make their best growth during the hot summer months and provide excellent grazing during the season when many grasses are more or less dormant. During the severe drought of 1930, when many new seedings of grass and clover were lost on account of dry weather, the lespedezas not only survived the very unfavorable season but actually provided grazing for livestock at a time when most other pasture plants failed.

Since lespedeza does not provide much grazing before June or July, early spring pasture must be provided by the grasses or a small grain grown for that purpose. The practice of sowing lespedeza on native pastures, rotation pastures, and permanent pastures, has become rather general not only on livestock farms but also on crop farms that maintain pastures for work stock and other farm animals. The grasses usually make their best growth early in the season and provide the early grazing, whereas the lespedeza occupying the thin places and bare spots comes on later to provide grazing during the summer and fall. The carrying capacity of old pastures has been more than doubled in many cases by sowing 10 to 15 pounds per acre of lespedeza seed on them early in the spring.

On some farms fall-sown small grain with lespedeza, seeded early in the spring, takes the place of the pasture grasses for early grazing. Rye or winter barley sown early in the fall provides the early spring grazing and by the time the grain is eaten down the lespedeza is usually large enough to carry the animals through the season. Such pastures can be renewed by disking the land in the fall after the lespedeza seed has matured and again drilling in rye or barley, allowing the lespedeza to volunteer. Should the land be too hard to be put in order with a

disk, a subsoiler may be used to break it up after which the land is disked and seeded. The Kobe or the Korean varieties are more frequently used for this method of providing pasture.

The carrying capacity of lespedeza pastures varies with the season, fertility of the soil, and method of grazing. The improved varieties, more particularly Kobe and Korean, were grown principally for seed until the price of seed dropped in the spring of 1932, when they were used more generally for hay and pasturage, especially on farms where livestock is an important enterprise. Few Kobe or Korean pastures have been grazed to their full capacity. Table 1 shows the time 10 fields of lespedeza were grazed and the number of animal units [2] pastured per acre. The lespedeza on most of these fields was grazed after the removal of a crop of small grain and in some instances the animals were taken off early so that a crop of seed could be harvested. The time grazed does not in all cases, therefore, represent the total time the field could have been grazed.

TABLE 1.—*Lespedeza pasture: Time grazed and number of animal units pastured on lespedeza alone*

State	Acres pastured	Time grazed	Days pastured	Total animal units	Animal units per acre	Variety
North Carolina	16	June 1–Oct. 15	137	10	0.62	Common.
	16	do	137	16	1.0	Do.
	18	June 15–Sept. 1	77	18	1.0	Korean.
	2	June 10–Sept. 20	102	4	2.0	Do.
	22	July 20–Aug. 31	42	60	2.7	Do.
	7	July 1–Sept. 30	92	14	2.0	Do.
Kentucky	100	July 1–Oct. 20	112	75	.75	Kobe and Korean.
	20	June 15–Oct. 20	127	16	.8	Kobe.
	25	July 1–Oct. 15	107	25	1.0	Do.
	25	do	107	40	1.6	Kobe and Korean.
Total	251		1,040	278		
Average	25.1		104		1.1	

Table 2 shows the time grazed and the number of animal units pastured per acre when lespedeza was included in pasture-grass mixtures, seeded on old pastures, and, in the case of one field, seeded on rye. The average number of animal units pastured per acre is the same as for lespedeza alone, but the average number of days pastured is about double that for lespedeza alone, or 211 as compared with 104.

TABLE 2.—*Lespedeza pasture: Time grazed and number of animal units pastured on lespedeza and grass*

State	Acres pastured	Time grazed	Days pastured	Total animal units	Animal units per acre	Variety used
North Carolina	14	Apr. 1–Feb. 1	275	20	1.4	Korean in mixture.
	14	Feb. 1–Oct. 30	273	10	.7	Do.
	35	Apr. 1–Oct. 30	213	39	1.1	Korean and bluegrass.
Kentucky	55	Apr. 1–Sept. 10	162	80	1.4	Korean on old pasture.
	35	Apr. 15–Sept. 10	147	35	1.0	Do.
	40	May 15–Nov. 15	184	45	1.1	Korean, Kobe, and grass.
	20	Mar. 10–Oct. 20	224	20	1.0	Kobe seeded on rye.
Total	213		1,478	249		
Average	30		211		1.1	

[2] An animal unit is 1 horse, mule, or cow; 2 yearlings; or 4 calves or colts; or 5 hogs; or 10 pigs; or 7 sheep or goats; or 14 lambs or kids.

A few results from grazing lespedeza follow.

Twenty acres of rye seeded to Kobe lespedeza in March 1931 was harvested for grain, and the lespedeza was harvested for seed. The rye and the lespedeza volunteered, and the field was grazed by 80 head of hogs from March 15 to the end of the season. In addition, 20 calves were grazed on the field. The first week in August it was mowed and 20 tons of hay was obtained. By the first of October the lespedeza had grown up, and another ton of hay per acre could easily have been cut.

On another farm, 50 acres of Kobe and 50 acres of Korean lespedeza furnished grazing for 75 head of cattle from July 1 to frost. A permanent pasture provided the early grazing.

On still another farm 25 acres of timothy and redtop on which 10 pounds per acre of Korean seed was sown in March, provided early pasture for 60 cattle and 100 sheep. This 25 acres and 30 acres of second-year Korean lespedeza were grazed alternately, and carried the 60 cattle and the 100 ewes and their lambs from April 1 to September 10. The 30 acres of Korean also produced a crop of seed.

SOIL IMPROVEMENT

The soil-building qualities of lespedeza are well known to most growers, yet the crop is seldom grown exclusively for that purpose. Soil improvement, in most cases, has come about in connection with the production of the crop for other purposes. In spite of the fact that the crop is nearly always removed from the land as hay, pasturage or seed, the yield of crops that follow 1 or 2 years of lespedeza are nearly always better than those that do not.

Lespedeza, like most other legumes, adds nitrogen to the soil through the action of the nitrogen-fixing bacteria that develop on the roots of the plant. Lespedeza has some advantages over most other legumes for soil improvement in that it will grow on almost any soil without artificial inoculation, fertilizers, or lime. It reseeds and makes a better growth the next year and rarely fails through unfavorable seasons. The expense of getting it started is little more than the cost of the seed.

The average yield of corn for all farms from which yields were reported was 15.4 bushels per acre where lespedeza had not been grown and 44.5 bushels per acre where corn followed lespedeza. The average yield of cotton was 200 pounds, or less than one half bale, per acre where cotton did not follow lespedeza and 1.1 bales per acre when cotton followed 1 or 2 years of lespedeza.

Table 3 shows the yield of corn on six fields before lespedeza was grown and the yield of corn on each field after the land had been in lespedeza from 1 to 3 years.

TABLE 3.—*Effect of lespedeza on the yield of corn*

State	Area in corn	Yield of corn before and after lespedeza was grown—			Increase in yield	
		Before	Period in lespedeza	After	Bushels	Percent
	Acres	*Bushels*	*Years*	*Bushels*		
North Carolina	20	10	1	25	15	150
	21	20	2	40	20	100
Kentucky	35	25	2	40	15	60
Tennessee	30	20	2	40	20	100
North Carolina	6	16	3	62	46	287
Tennessee	24	25	3	40	15	60
Total	136	116	----------	247	131	----------
Average	22.6	19.3	----------	41.1	21.8	113

The increase in the yield of corn is greater, of course, on the fields where the yield was lowest before lespedeza was grown (fig. 2). The effect of a soil-building crop on yields usually varies with the kind of soil. The heavier soils respond more readily to a small increase in the organic content than do the lighter soils. Since the soils on which these fields are located vary from a rather light sandy loam to a heavy clay loam there is little relation between the yield and the number of years the field was in lespedeza.

The crop yields shown in tables 3 and 4 were made on different farms in two widely separated areas of North Carolina and Tennessee during the period from 1923 to 1931, inclusive. There was no increase in the quantity of fertilizer applied to the corn and cotton that followed lespedeza. On 3 of the 6 fields mentioned in table 3 no fertilizer was applied to either corn crop. Table 4 shows the yield of cotton on 10 fields before lespedeza was grown and the yield of cotton on the same fields after the land had been in lespedeza from 1 to 4 years. There was no increase in the total quantity of fertilizer applied to the cotton that followed lespedeza but in several cases there was an actual decrease in the quantity of nitrogen applied when cotton followed 3 years of lespedeza.

TABLE 4.—*Effect of lespedeza on the yield of cotton*

State	Area in cotton	Yield of lint cotton before and after lespedeza was grown—			Increase in yield	
		Before	Period in lespedeza	After	Pounds	Percent
	Acres	*Pounds*	*Years*	*Pounds*		
North Carolina	15	250	1	500	250	100
	12	250	2	500	250	100
Tennessee	15	100	2	250	150	150
	23	375	2	500	125	33
North Carolina	16	125	3	500	375	300
Tennessee	12	167	3	500	333	199
	30	250	3	500	250	100
	29	250	3	600	350	140
	17	334	3	750	416	124
North Carolina	24	125	4	800	675	540
Total	193	2,226	----------	5,400	3,174	----------
Average	19.3	222.6	----------	540	317.4	142

The difference in yield may be partly due to seasonal variation, but the fact that the yields occurred in different years on a number of farms in different localities indicates that the increase in yield is in large part due to the effect of lespedeza.

The increase in the yield of cotton closely follows that of corn in that the greater increase usually occurs on the fields where the yield was lowest before lespedeza was grown. The increase in the yield of cotton is somewhat greater following 3 years of lespedeza than following 2 years.

The low initial yields on these fields were not due so much to improper methods of farming as to the failure of the crops that are generally relied on to keep the soil in a productive condition. This is well illustrated by the results on a grain-and-livestock farm where lespedeza has taken the place of clover in the rotation. The land on this farm is rolling, with an upland clay soil that is fairly productive when well supplied with organic matter.

FIGURE 2.—Corn grown after lespedeza produced 46 bushels per acre (right), as compared with 25 bushels per acre (left) when corn was grown in the same field on land on which no lespedeza had been grown—an increase of 21 bushels per acre, or 84 percent, due to the previous growing of lespedeza.

The crop rotation was corn, wheat, and hay. Redtop, orchard grass, and red clover were sown for hay. Oats came into the rotation occasionally as a grain crop. Fertilizers were used regularly, and occasionally the land was limed. The crop yields with this system were: corn, 13 bushels; wheat, 8 bushels; oats, 20 bushels; and hay, 1 to 1½ tons per acre.

The essential difference between the system just outlined and the one now in use is that lespedeza takes the place of the clover and grasses in the rotation and lime is not used at all. The rotation now is corn, wheat seeded to lespedeza, and oats seeded to lespedeza. Lespedeza is seeded on the wheat in February and on the oats behind the drill in February or March. The rate of seeding lespedeza is 25 to 30 pounds per acre. After the grains are harvested, the lespedeza occupies the land the remainder of the season and is used for hay, pasturage, or seed. Although this system has been in operation only a few years, the crop yields have increased and in 1932 were 50

bushels of corn, 24 bushels of wheat, 40 bushels of oats, and 1½ to 2 tons of hay per acre, respectively.

The following is an example of the way lespedeza was used to bring back some very unproductive land: The soil on this farm, a sandy loam, was badly eroded and was reduced in fertility to the point where 10 acres of cotton with 200 pounds per acre of 2–8–2 fertilizer produced a total yield of only 2 bales, or 100 pounds of lint cotton per acre. The county agent for some time had encouraged the use of lespedeza as a farm crop in the county, and at his suggestion a rotation of cotton 1 year and lespedeza 2 years was begun. The cotton ground was disked and harrowed in the spring and seeded to lespedeza at the rate of 25 pounds per acre without fertilizer. The lespedeza was cut for hay in places where it grew tall enough, and the land was turned for cotton. The improvement was slow and took several years. In 1931 the same field, with an application of 95 pounds of 16-percent superphosphate per acre, made a yield of 1⅓ bales, or about 660 pounds of lint cotton per acre.

In another case oats on the same field 3 years in succession gave the following results: A field of run-down cotton land was plowed and seeded to oats in February with 10 pounds per acre of Korean lespedeza seeded on top of the ground behind the drill. The land was then fertilized with 500 pounds of basic slag and 200 pounds of 4–8–8 fertilizer per acre. The yields the first year were 26 bushels of oats and 9 bushels of lespedeza seed per acre. After the lespedeza seed was harvested the land was turned and left until the next spring, when it was disked to bring the shattered lespedeza seed to the surface and was again seeded to oats. No lespedeza seed was sown after the first year. The yields the second year, with 200 pounds of 4–10–4 fertilizer per acre, were 43 bushels of oats and 14 bushels of lespedeza seed per acre. The same procedure was followed for the third crop of oats. The yields the third year, with 200 pounds of 4–10–4 fertilizer per acre, were 74 bushels of oats and 20 bushels of lespedeza seed per acre.

FERTILIZERS

Lespedeza responds readily to the application of fertilizers and from a soil-building viewpoint fertilizers should be more generally used when lespedeza is sown on land that is low in fertility. The fertilizer most generally applied to lespedeza is similar in analysis to that applied to the other crops, except that on the more fertile soils the nitrogen may be omitted. On some soils phosphate alone is applied, on others phosphate and potash are both used. Some of the lespedeza-seed growers are using a complete fertilizer, analyzing 4 percent of nitrogen, 12 percent of phosphoric acid, and 4 percent of potash, at the rate of 400 to 500 pounds per acre when lespedeza is sown for the first time on thin land. On land that is in a more productive condition 200 to 300 pounds of a 0–10–4 mixture is used. A few growers are using basic slag at the rate of 400 to 500 pounds per acre.

Lespedeza seeded on grain that has been fertilized derives some benefit from the fertilizer that may be left in the soil, but usually the quantity of fertilizer applied is little in excess of the quantity needed by the grain and does not greatly benefit the lespedeza, especially when the lespedeza stays down 2 or 3 years following the grain. The yields of lespedeza have usually been better where grain and lespedeza are grown on the same land 2 or more years in succession, since each

grain crop is fertilized and more fertilizer is left in the soil for the lespedeza.

The value of a soil-building crop depends on the quantity of nitrogen and organic matter it will add to the soil. Since the quantity of these materials produced depends to a large extent on the growth made, the soil can usually be built up more rapidly by applying fertilizer to the legume grown for this purpose. Two or three hundred pounds per acre of superphosphate applied to lespedeza that is to be turned under for corn will usually produce a better yield of corn than the same quantity applied to the corn crop directly.

LIME

Lime is usually applied either to correct soil acidity or to improve the physical condition of the soil. Frequently it does both and may also supply the calcium necessary for plant growth.

Lespedeza does not appear to be sensitive to most soil conditions that are usually corrected by the application of lime. But like many other crops it does better on land that is in good physical condition, and when an application of lime improves the physical condition of the soil it will have a beneficial effect on the growth of lespedeza just as it does on other crops that do not require a neutral or alkaline soil.

Comparatively few growers lime the land for lespedeza. In most cases lime does not appear to be necessary. Lespedeza is frequently grown, however, on land previously limed for other crops and nearly always does well. On one farm the Korean and the Kobe varieties were seeded on fall-sown barley and rye, respectively, after the land had been prepared and limed at the rate of 2½ tons per acre. This was a rather heavy clay soil. Both varieties made an excellent growth. The greater part of the acreage of lespedeza in Virginia, North Carolina, and Tennessee occurs on land that has not been limed, and on much of this land alfalfa and clover cannot be grown at all without heavy applications of lime.

SOIL EROSION

Soil erosion is a serious problem on many of the farms located in the area under discussion, and every effort should be made to prevent the loss of fertility from soil washing. The extent of washing varies with the kind of soil, slope of land, and methods of farming. Erosion is more severe, other factors being equal, where a large part of the farm is in intertilled crops from year to year than where the grasses and other soil-holding crops are included in the cropping system. Farmers located on land that is inclined to wash, all report much less washing on fields where lespedeza is grown. They state that lespedeza not only reduces the amount of soil washing while the crop occupies the land, but the mass of fibrous roots continues to hold the soil for 1 or 2 years after the crop is removed, permitting the land to be farmed in intertilled crops and reducing the loss in fertility from excessive soil washing.

It would be difficult to estimate the value of the Common lespedeza, growing as it does in pastures, open woodland, and waste places, as a soil-holding plant. The improved varieties have also proved very effective as soil-holding plants. In a number of instances, Korean seeded on badly eroded hillside pastures has completely stopped soil

washing in 2 to 3 years. Lespedeza might well be used to stop the erosion of highway embankments and to help in other instances where the soil needs to be held in place.

ORCHARD COVER

The Common lespedeza has been used for some time as an orchard cover by Tennessee fruit growers. The introduction of the improved varieties has extended this practice to other localities. In Maryland and Virginia the Korean variety is used by some of the fruit growers as a cover crop in peach and apple orchards. The usual practice is to disk and harrow the land early in the spring while the soil is still loose and easily worked and to sow the seed in March or the first part of April. Lespedeza will grow in partial shade, adds nitrogen and organic matter to the soil, and holds the land in place. Once established in an orchard, it will reseed each year and yield a cutting of hay (fig. 3).

FIGURE 3.—Lespedeza used for orchard cover and for pasture.

The orchard can be disked and harrowed in the usual way without interfering with the lespedeza, provided the disking is done early, before much of the seed has germinated. If the land were plowed, the seed would be turned under too deep for the crop to volunteer, and a new seeding would be necessary for a full stand.

CROPPING SYSTEM

A great many of the cropping systems in use in Virginia, North Carolina, Tennessee, and Kentucky include one or more of the small grains. In cropping systems that include a small grain, lespedeza nearly always follows the small grain and precedes an intertilled crop. In cropping systems that do not include a small grain, lespedeza follows an intertilled crop and occupies the land 1 or 2 years, during which time it is cut for hay or seed.

The fact that lespedeza can be grown on almost any part of the farm without the necessity of liming the land or giving it other special treatment makes the crop readily available for use in cropping systems

in which a legume is needed for hay, or for pasturage or soil improvement. The Korean variety matures seed in time to permit a fall-sown crop to be planted the same year. A fall-sown crop can also follow the other varieties when they are cut for hay.

A field can be seeded to lespedeza in the spring, and a crop of hay or seed can be harvested the same year. The land can then be turned for the next crop, or the lespedeza can be allowed to volunteer for hay or seed the second year. The place that lespedeza occupies in the cropping system and the use made of the crop vary with the type of farming. The cotton grower located on a sandy loam soil usually employs a slightly different cropping system from that employed by the cotton grower on a clay soil, and both systems may be different from those in use on grain and livestock farms.

Few, if any, changes in the crop sequence need be made when lespedeza is added to the cropping system. In many rotations lespedeza either takes the place of the grass and clover or is grown with them. Where the soil and climatic conditions are unfavorable for the production of clover and grass, lespedeza can be grown to supply the nitrogen and organic matter necessary to maintain soil fertility and round out the rotation. In a few cases a small grain—usually oats—has been added to the cropping system, since a crop of oats and a crop of lespedeza can be grown on the land the same year without an extra plowing.

The rotations outlined below are all in actual use and are given here to show how lespedeza fits in with some of the other crops usually grown in the area under discussion.

The following 3-year rotation is used on farms on which cotton is an important crop and on which wheat does not yield well:

First year, cotton or corn.
Second year, oats, seeded to lespedeza.
Third year, volunteer lespedeza.

The acreage of oats in this rotation is the same as the combined acreage of cotton and corn, since oats follows both of these crops.

The second year of this rotation provides a crop of oats for hay or grain and a crop of lespedeza hay or seed. The lespedeza can be left to volunteer for the third year of the rotation or the land can be turned for the next crop. The usual practice is to let the lespedeza volunteer 1 or 2 years. On farms on which cotton is grown only on certain fields of the farm because of the difference in soil conditions, two rotations are used—one for cotton and another for corn.

Where the soil is sufficiently uniform and adapted to the production of wheat and oats as well as cotton and corn, one of the following 3-year rotations is used:

First year, cotton or corn.
Second year, wheat, seeded to lespedeza.
Third year, oats, seeded to lespedeza.
First year, corn, with soybeans between the rows.
Second year, cotton.
Third year, wheat or oats, seeded to lespedeza.

Each of these rotations can be lengthened by allowing the lespedeza to volunteer.

Another 3-year rotation used mainly on sandy loam soils adapted to the production of peanuts as well as cotton follows:

First year, peanuts.
Second year, small grain, seeded to lespedeza.
Third year, cotton.

Small grain—winter oats or rye—is seeded by hand on the peanut field just before the peanuts are dug. After the peanuts are stacked the land is harrowed to level the surface and cover any of the grain not covered by the digging operation. Corn is grown on another part of this farm not so well adapted to the production of cotton and peanuts.

The following 4-year rotation is in use on a farm on which dairying is an important enterprise:

First year, cotton.
Second year, winter oats and vetch, seeded to lespedeza.
Third year, corn, with soybeans between the rows.
Fourth year, wheat, seeded to lespedeza.

This rotation provides hay and grain for the dairy cows and two cash crops. A legume is grown on 3 of the 4 fields each year.

In Kentucky and Tennessee dark tobacco is usually grown on soils that are fairly well-adapted to the production of wheat as well as tobacco, and, in the rotation most generally employed, corn or tobacco is followed by wheat, on which grass and clover for hay are seeded the third year of the rotation.

First year, corn or tobacco.
Second year, wheat and timothy, seeded to clover, and lespedeza.
Third year, hay—timothy and clover and lespedeza.

The clover and lespedeza produces a crop of hay after the wheat is harvested, and the following year a crop of timothy and clover can be cut early in the season and later the same year a crop of lespedeza hay or seed can be harvested.

Tobacco growers who do not lime the land regularly and have difficulty in getting red clover to grow, either sow lespedeza alone or a mixture of redtop and lespedeza in place of timothy and clover. Most growers report an increase in yield and a better quality of tobacco when tobacco follows lespedeza.

The following 4-year rotation of corn, wheat, oats, and hay, in use on many farms where livestock is an important enterprise, has been considerably improved by the addition of lespedeza.

First year, corn, with soybeans between the rows.
Second year, wheat.
Third year, oats, seeded to grass and clover.
Fourth year, hay, grass and clover.

It will be observed that grass and clover does not follow the wheat since the wheat stubble must be turned for the oats and this does not allow sufficient time for the grass and clover to become established before the field is plowed for oats. The grass and clover following the oats may produce a light crop of hay if the season is favorable. The same rotation with lespedeza added is as follows:

First year, corn, with soybeans between the rows.
Second year, wheat seeded to lespedeza.
Third year, oats, seeded to grass and lespedeza.
Fourth year, hay or pasture.

With lespedeza added to the rotation, a legume is on the land each year. The lespedeza seeded on the wheat produces a crop of hay or seed, and the grass and lespedeza seeded on the oats produces a crop

of lespedeza hay. The fourth year of the rotation a crop of grass hay and a crop of lespedeza hay or pasture are produced. The grass will provide early grazing and carry the animals until the lespedeza has made sufficient growth to carry the animals the remainder of the season.

Where the soil is well adapted to the production of wheat the 5-year rotation of corn, wheat 2 years, hay, and pasture has long been in use on grain and livestock farms. The following plan shows this rotation with lespedeza in place of the grass and clover:

First year, corn.
Second year, wheat, seeded to lespedeza.
Third year, wheat, volunteer lespedeza.
Fourth year, lespedeza.

The corn ground is disked and harrowed in the fall before the wheat is sown. Lespedeza is sown broadcast on the wheat in March. After

FIGURE 4.—Harvesting seed of the Common and Tennessee 76 varieties by means of a seed pan attached to the back of the cutter bar of a mower.

the wheat is harvested the lespedeza produces a crop of hay or seed, after which the stubble is disked and again seeded to wheat. The lespedeza, Korean variety, reseeds the land, and a volunteer crop follows the second-year wheat. The fourth year of the rotation also provides for volunteer lespedeza, which is used for hay, pasture, or seed. A crop of corn, 2 crops of wheat, and 3 crops of lespedeza are produced with 1 plowing.

SEED

Seed of the Common and Tennessee 76 varieties is nearly always harvested by attaching a seed pan to the back of the cutter bar of a mower (fig. 4). The Kobe can also be harvested this way, but because the seed of the Korean is held more firmly and does not shatter so readily as the other varieties, the pan method is not used to any extent in harvesting Korean. The usual practice with Kobe and Korean is to cut and rake the crop while the dew is on and allow it to dry in the

windrow and then run it through an ordinary grain thresher. Since the Kobe shatters more readily than the Korean the former variety must be harvested rather promptly after the seed has matured. The combine-harvester has been used by a few growers for harvesting lespedeza seed. Some growers prefer to cut the lespedeza with a mower and rake in the windrows, and after it is sufficiently dry, they use the combine with a pick-up attachment for threshing out the seed. In a few instances the combine has been used to harvest lespedeza seed in much the same way as in harvesting grain.

WEEDS

Weeds are usually more troublesome in thin stands of lespedeza than they are where the ground is well covered, and for that reason many growers prefer a heavy seeding—35 to 40 pounds of seed per acre. Even in thick stands there may be considerable weed growth when lespedeza is sown alone. There is less trouble from early season weeds when lespedeza is sown on small grain. Later in the summer, however, other weeds may come up through it. There is no very satisfactory way to control weed growth when lespedeza is sown on weedy land. The usual practice is to clip the weeds once or twice a year with a mower. The first clipping is made while the lespedeza is small. It usually retards the weed growth sufficiently to permit the crop to outgrow the weeds. Early clipping is seldom necessary when lespedeza follows small grain. Later in the season ragweed and other summer-growing weeds may make a second clipping desirable. This clipping is made with the cutter bar of the mower set high and if there is much weed growth the weeds are raked up and hauled off the field.

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